

REMARKS

Claims 1 to 3, 5, 6, 9, 11 and 12 were rejected under 35 U.S. §103(a) as being unpatentable over Fujii (US 5,663,628) in view of Yoshikawa et al. (US 6,317,697). Claims 4 and 10 were rejected under 35 U.S. §103(a) as being unpatentable over Fujii in view of Seri et al. (US 5,994,877). Claims 7, 8 and 13 to 20 were rejected under 35 U.S.C. §103(a) as being unpatentable over Fujii and Yoshikawa et al. in view of Kinoshita (US 5,703,469).

Reconsideration of the application based on the following is respectfully requested.

Rejections under 35 U.S.C. §103(a)

Claims 1 to 3, 5, 6, 9, 11 and 12 were rejected under 35 U.S. §103(a) as being unpatentable over Fujii (US 5,663,628) in view of Yoshikawa et al. (US 6,317,697).

Fujii discloses a battery system with leveled discharge. A battery provides energy to a load L by supplying current through a limiting resistor to an electric double load layer capacitor, which discharges a current greater than that supplied by the battery to the load. (Col. 2, Lines 47 to 48). A discharge controller causes the capacitor to discharge the energy at a greater current to the load intermittently for a time period that is shorter than the period that the battery charges the capacitor. (See, e.g., Col. 2, Lines 62 to 67). Allowing the battery to emit a smaller current reduces the depth of discharge of the battery and increases the number of cycles the battery, extending the life of the battery. (See, e.g., Col. 11, Lines 54 to 64).

Yoshikawa et al. discloses a battery life determination apparatus and method. A life storing means stores relationships between standard total values of discharge of a battery and the standard life of the battery. (Col. 2, Lines 45 to 48). A discharge voltage drop totalizing means totals the discharge voltage drops amounts since the start of discharge of the battery. (Col. 2, Lines 48 to 51). A life determination means determines the life of the battery from a measured total value of totalized discharge voltage drop amounts and the standard total values of the storage means. (Col. 2, Lines 51 to 54).

Claim 1 recites: “A method for determining a deterioration of a battery, comprising: measuring respective numbers of charge and discharge cycles at a plurality of depths of discharge of the battery;

determining a respective characteristic deterioration value for at least some of the charge and discharge cycles at each of the plurality of depths of discharge using a deterioration curve characteristic of a type of the battery; and

summing the determined characteristic deterioration values so as to obtain the deterioration of the battery.”

It is respectfully submitted that neither Fujii nor Yoshikawa et al. discloses “determining a respective characteristic deterioration value for at least some of the charge and discharge cycles at each of the plurality of depths of discharge using a deterioration curve characteristic of a type of the battery,” as recited in claim 1.

It is respectfully submitted that, contrary to the assertion on pages 7 of the Office Action, Fuji, in Fig. 6 and at col. 11, lines 54 to 59, does not disclose “determining characteristic deterioration value of the charge and discharge cycle and a plurality of depths of discharge,” as recited in claim 1. Fig. 6 of Fujii only shows the number of cycles in the life of one battery at different depths of discharge of the one battery. Fig. 6 does not indicate how the one battery deteriorates during the life of the battery and thus does not disclose “determining a respective characteristic deterioration value,” as recited in claim 1. Also, Fujii is clear that, in the embodiment discussed, “the depth of discharge is set to 10%” (Col. 11, Lines 58 to 59). Thus, it is clear that Fujii also does not teach or disclose “determining a respective characteristic deterioration value... at each of the plurality of depths of discharge,” as recited in claim 1.

Furthermore, it is respectfully submitted that it would not have been obvious to one of skill in the art to have placed the totalizer 56 taught in Yoshikawa et al. in the battery system of Fujii to meet the limitation “summing the determined characteristic deterioration values so as to obtain the deterioration of the battery,” as recited in claim 1. Fujii discloses extending the life of a battery and increasing the number of charging and discharging cycles by reducing the depth of discharge of the battery (See, e.g., Col. 11, Lines 54 to 64), and does not at all discuss determining the remaining life of a battery, as the totalizer 56 of Yoshikawa et al. is used. Although Fig. 6 of Fujii shows a relationship between depth of discharge and cycle times of one battery, Fujii does not indicate any relationship between the remaining life of the battery and depth of discharge or any relationship between the remaining life of the battery and number of cycles. (See Fig. 6; Col. 11, Lines 54 to 59). Thus, Fujii does not provide values that could be summed “to obtain the deterioration of the battery,” as recited in claim 1, and there would have

been no reason to have placed the totalizer 56 of Yosikawa et al. in the battery system of Fujii et al.

Withdrawal of the rejection under 35 U.S.C. §103(a) to claims 1 to 3, 5, 6, 9, 11 and 12 is respectfully requested.

With further respect to claim 2, claim 2 recites: "The method as recited in claim 1 wherein each respective charge and discharge cycle is a respective partial cycle, the measuring being performed so as to measure the respective partial cycle separately." It is respectfully submitted that neither Fig. 6 nor col. 18, lines 56 to 64 of Yoshikawa, cited in the Office Action on page 3, teach or disclose "wherein each respective charge and discharge cycle is a respective partial cycle" or "the measuring being performed so as to measure the respective partial cycle separately," as recited in claim 2. Rather, it is respectfully submitted that Fig. 6 of Yoshikawa shows a discharge voltage drop amount and does not show a respective charge and discharge cycle at all. Moreover, at col. 18, lines 56 to 64, Yoshikawa discusses an initial discharge of a battery, not respective charge and discharge cycles.

With further respect to claim 3, it is respectfully submitted that contrary to the assertion of the Office Action at page 3, Fig. 6 of Fujii does not disclose "the deterioration curve is a continuous function defining a dependence of each characteristic deterioration value on the depth of the respective charge or discharge for the battery type," as recited in claim 3. The curve in Fig. 6 of Fujii defines the number of cycles a battery can perform depending on the depth of discharge that is constantly used throughout the cycles. (See Fig. 6; Col. 11, Lines 54 to 59).

Claims 4 and 10 were rejected under 35 U.S. §103(a) as being unpatentable over Fujii in view of Yoshikawa et al. and further in view of Seri et al. (US 5,994,877).

Fujii and Yoshikawa et al. are described above.

Seri et al. discloses methods for detecting a working condition of a non-aqueous electrolyte secondary battery which allow easy and accurate determination of the degree of degradation and remaining capacity of the non-aqueous electrolyte secondary battery by a simple test irrespective of the past charging and discharging history of the battery. (Abstract).

Claim 4 recites the method as recited in claim 1 wherein the deterioration curve includes approximated intervals having a class width adapted to the respective battery type, the deterioration curve defining a dependence of a respective characteristic deterioration value on the depth of the respective charge or discharge.

Claim 10 recites the method as recited in claim 2 wherein the deterioration curve includes approximated intervals having a class width adapted to the respective battery type, the deterioration curve defining a dependence of a respective characteristic deterioration value on the depth of the respective charge or discharge.

In view of the above arguments with respect to claim 1, withdrawal of the rejection under 35 U.S.C. §103(a) to claims 4 and 10 is respectfully requested.

Furthermore, it would not have been obvious for one of skill in the art to have combined Fujii and Yoshikawa et al. with Seri et al. to meet the limitations of claims 4 and 10 because Seri et al. teaches away from claims 4 and 10. It is respectfully submitted that at Col. 6, Lines 46 to 52, cited at page 4 of the Office Action, Seri et al. teaches away from “measuring respective numbers of charge and discharge cycles at a plurality of depths of discharge of the battery,” as recited in claim 1, which claims 4 and 10 depend, because Seri et al. discloses determining the number of charge and discharge cycles for only one depth of discharge (3.0 V). (See, e.g., Fig. 1; Col. 6, Lines 16 to 52).

Also, it is respectfully submitted that, contrary to the assertion of the Office Action on page 4, Seri et al., at Col. 6, Lines 46 to 52, does not disclose “the deterioration curve includes approximated intervals having a class width adapted to the respective battery type,” as embodiment 1 of Seri et al. only relates to one model of lithium ion batteries. (See Col. 6, Lines 16 to 20).

Claims 7, 8 and 13 to 20 were rejected under 35 U.S.C. §103(a) as being unpatentable over Fujii and Yoshikawa et al. in view of Kinoshita (US 5,703,469).

In view of the above arguments with respect to claim 1, withdrawal of the rejection under 35 U.S.C. §103(a) to claims 7, 8 and 13 to 20 is respectfully requested.

Furthermore, the Office Action, at page 5, relies on Seri et al. to support rejections of claims 7, 8, 13, 14, 15 and 18 and is in error, as Seri et al. was not relied upon to reject these claims. Also, as stated above, Seri et al. teaches away from claim 1 and thus one of skill in the

art would not have had any reason to have combined Seri et al. with Fuji, Yoskikawa et al or Kinoshita to teach the limitations of claim 1 or any dependent claim thereof. (See, e.g., Fig. 1; Col. 6, Lines 16 to 52).

CONCLUSION

The present application is respectfully submitted as being in condition for allowance and applicants respectfully request such action.

Respectfully submitted,
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